ITx Policy Analysis using Interrupted Time Series: Syllabus

UBCx University of British Columbia

Course Description

In this course, we comprehensively introduce you to interrupted time series analysis (ITS) and regression discontinuity designs (RD) from start to finish. These intuitive study designs allow rigorous analysis of the effect of policy changes, and are especially useful where setting up an experiment is not practical or feasible.

In week 1 we introduce the design and discuss relevant data sources. In week 2 we set up data, and conduct analysis of the simplest case, a single interrupted time series. In week 3 we add a control group, which may be an option to add strength to your analysis. In week 4 we go over solutions to potential pitfalls and special cases for analysis, before wrapping up in week 5 by covering regression discontinuities and covering any additional issues that arise during the course.

Throughout the course, you'll gain practice using R software to complete analysis and answer questions. You will also develop a real-life research proposal that could form the basis of future research. At the conclusion of the course, you will have all the tools necessary to propose, conduct and correctly interpret an analysis using ITS and RD approaches.

Requirements

Participants should have a basic understanding of linear regression techniques, including familiarity with data manipulation and analysis using a major statistical package (e.g. R, SAS, SPSS, STATA.).

Course Team

Instructor: Dr. Michael Law, Associate Professor, University of British Columbia, Vancouver, Canada

Course Format

Each week, we'll introduce materials through a combination of text and video instruction. Throughout the course, we have interleaved short questions below the videos to test your understanding of key concepts. These unmarked questions have been included to help you consolidate your knowledge of each concept, and check your own understanding of the material. You can submit your answers as many time as you would like.

GRADED ASSIGNMENTS

Your final grade will be based on weekly quizzes worth 100% of your final grade. A passing grade in this course is 50%.

WEEKLY QUIZZES

Each week you will complete short quizzes based on your understanding of the weekly topics. To prepare for these quizzes ensure that you watch all of the weekly videos and complete the video

COURSE OUTLINE

WEEK 1: INTRODUCTION

TOPICS COVERED:
- Internal Validity
- Observational Study Designs
- Interrupted Time Series
- Analysis Steps
- Introduction to R and RStudio

READINGS:

Penfold R and Zhang F. Use of Interrupted Time Series in Evaluating Health Care Quality Improvements. Academic Pediatrics 13(6):S38-S44.
http://www.academicpedsjnl.net/article/S1876-2859%2813%2900210-6/abstract

Jandoc R et al. Interrupted time series analysis in drug utilization research is increasing: systematic review and recommendations. Journal of Clinical Epidemiology 68(8): 950-956.
http://www.jclinepi.com/article/S0895-4356%2815%2900123-7/abstract

Taljaard et al. The use of segmented regression in analysing interrupted time series studies: an example in pre-hospital ambulance care. Implementation Science 9(77): B8.
http://www.implementationscience.com/content/9/1/77#B8

Optional Further Readings

Shadish, Cook & Campbell. Experimental and Quasi-experimental Designs for Generalized Causal Inference. Houghton Mifflin 2002.

WEEK 2: MODELING AN INTERRUPTED TIME SERIES

TOPICS COVERED:
- Data Setup
- Preliminary Analysis
- Autocorrelation
- Run Final Model
- Plot Results and Predict Changes
- Proposal Assignment: Background and Objectives

READINGS:

Serumaga B, et al. Effect of pay for performance on the management and outcomes of hypertension in the United Kingdom: interrupted time series study BMJ 2011; 342:d108
http://www.bmj.com/content/342/bmj.d108

WEEK 3: ADDING A CONTROL GROUP

TOPICS COVERED:

- Data Setup
- Preliminary Analysis
- Autocorrelation
- Run Final Model
- Plot Results and Predict Changes

READINGS:

Santa-Ana-Tellez Y, Mantel-Teeuwisse AK, Dreser A, Leufkens HGM, Wirtz VJ (2013) Impact of Over-the-Counter Restrictions on Antibiotic Consumption in Brazil and Mexico. PLoS ONE 8(10): e75550. doi:10.1371/journal.pone.0075550
http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0075550

WEEK 4: ITSx EXTENSIONS

TOPICS COVERED:

- Advanced modeling issues in ITS and RD
- Non-linear trends
- Differencing
- "Wild" points and transition periods
- Adding a second intervention

READINGS:

Garabedian L et al. Impact of universal health insurance coverage in Thailand on sales and market share of medicines for non-communicable diseases: an interrupted time series study. BMJ Open 2012;2:e001686 doi:10.1136/bmjopen-2012-001686
http://bmjopen.bmj.com/content/2/6/e001686.abstract

Law MR et al. Effect of illicit direct to consumer advertising on use of etanercept, mometasone, and tegaserod in Canada: controlled longitudinal study BMJ 2008; 337 :a1055
http://www.bmj.com/content/337/bmj.a1055

Valiyeva E, et al. Effect of regulatory warnings on antipsychotic prescription rates among elderly patients with dementia: a population-based time-series analysis. Canadian Medical Association Journal 179.5

(2008): 438-446.
http://www.cmaj.ca/content/179/5/438.full

Lee DS and Lemieux T. Regression Discontinuity Designs in Economics. NBER Working Paper w14723 (2009).*
https://ideas.repec.org/p/nbr/nberwo/14723.html

* Note: this paper is very technical, so don't worry about understanding every detail. We have included it as it provides a good overview of the method and some excellent examples from the literature.

WEEK 5: REGRESSION DISCONTINUITIES

TOPICS COVERED:
- Regression discontinuities
- Other statistical packages